We believe that this child's illness was caused by infection with *B. burgdorferi*, or a very similar bacterium, on the basis of the history of the erythema chronicum migrans-like lesion following an insect bite which preceded the recurrent febrile illness and the serologic profile [6]. The pattern of fever, although recurrent, did not typify the usual descriptions of relapsing fever [7]. Rather, this illness would have been more accurately classified as a 'fever of unknown origin'. The response to erythromycin is also consistent with borreliosis. Furthermore, we postulate that the amoxycillin-associated anaphylaxis and the eczematoid rash were probably a Jarisch–Herxheimer reaction and a chronic *Borrelia* dermatopathy respectively.

Fever is a relatively common symptom in pediatric Lyme disease. Williams et al. [5] found fever (>101°F) to be present in approximately one-half of all patients. In addition, the latter investigators found that the common clinical characteristics included erythema chronicum migrans-like rash, 'flu-like' symptoms, arthritis/arthralgia, and a history of tick bite. A prolonged and recurrent febrile illness, as witnessed for our patient, has not been described among children. Intermittent and recurrent fever is, however, a hallmark of the relapsing fever illnesses that are caused by non-*B. burgdorferi* borreliae, but the frequency of such recurrences is generally 1–5; again very unlike our patient [7]. The *Borrelia* serology for our patient was not supportive of *B. hermsii* infection.

Fever of unknown origin has long been studied, especially in adults, and the need for a definition which is based on length of undiagnosed illness has been proposed. The addition of Lyme disease to the list of etiologic agents possibly associated with fever of unknown origin would only have been possible over the last decade, when the causative bacterium was discovered and when the laboratory diagnosis could be more certain. Indeed, Kazanjian [8] attributed fever of unknown origin to Lyme disease in 1 of 86 patients in a contemporary series. Nevertheless, the clinical course of our patient was unusual, given the especially prolonged course of the febrile illness. It is conceivable that similar presentations may become more numerous as experience with pediatric Lyme disease increases.

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Disseminated mucormycosis due to *Absidia corymbifera* in a patient with inflammatory bowel disease

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Mucormycosis is a rare fungal disease principally caused by species of the order Mucorales, family Mucoraceae (*Rhizopus*, *Rhizomucor*, *Absidia* and *Mucor*) [1]. This infection is usually seen in patients with certain underlying diseases and predisposing conditions. One of the most important features of the disease is that diagnosis is rare ante mortem, since signs and symptoms are non-specific, and the clinical course is often fatal, especially in disseminated forms. However, the infection is potentially curable with systemic administration of amphotericin B, agressive surgical debridement, and control of the underlying disease. We report a disseminated form of mucormycosis caused by *Absidia corymbifera*, in a patient under treatment with steroids and cytostatic agents because of inflammatory bowel disease.

A 60-year-old man was admitted to the hospital on 12 January 1995, following a 14-day history of

weight loss, abdominal colic, vomiting and bloody diarrhea. A diagnosis of inflammatory bowel disease was made on the basis of the histopathologic findings in an intestinal mucosal biopsy, and treatment with total parenteral nutrition, oral sulfasalazine (3 g/day), intravenous methylprednisolone (20 mg t.i.d.), and oral 6-mercaptopurine (200 mg/day) was initiated.

Eleven days after his hospital discharge he was readmitted with high fever, nausea and vomiting, diarrhea and continuous pain in his right flank. The white blood cell (WBC) count was 5900/mm^3 (43% neutrophils, 55% lymphocytes and 2% monocytes), but 4 days later the WBC count was 1400/mm^3 (65% neutrophils, 31% lymphocytes and 4% monocytes), and there was a significant rise in the blood aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, γ-glutamyltransferase, bilirubin and lactate dehydrogenase (LDH) levels. Repeated cultures of urine, stool and blood samples were negative. An abdominal CT scan showed enlargement of the right kidney with multiple hypodense areas inside, but microscopic examination and culture of material obtained by percutaneous puncture failed to yield any pathogen. Empirical treatment with ceftazidime, amikacin, vancomycin and metronidazole was started but fever persisted. Two weeks later the patient presented increased abdominal tenderness and severe bloody diarrhea, and he underwent laparotomy. The whole colon was inflamed, the right kidney was enlarged, and there were small amounts of free peritoneal fluid. An elective nephrectomy and a total colectomy were performed.

Histopathologic study of the right kidney revealed large areas of necrosis and a chronic inflammatory infiltrate of lymphocytes and plasma and giant cells. The blood vessels of the right kidney and mesocolon were thrombosed, and the vessel walls were invaded by numerous hyphae; these were broad and non-septate and branched at right angles. Culture of the surgical specimen of the right kidney yielded a rapidly growing fungus identified as *Absidia corymbifera*.

Treatment was changed to systemic amphotericin B at low doses (0.7 mg/kg/day), because renal function began to deteriorate. However, his state was complicated by multi-organ failure and he died 8 days later. An autopsy was not performed.

In a recent autopsy-based Spanish study, postmortem examination showed evidence of fungal infections in 3.5% (22/632) of all autopsies recorded between 1986 and 1993. Only one instance of infection by zygomycetes was encountered (1/22) [2]. The true incidence of this infection is difficult to estimate. The problem with diagnosis arises in growing the fungus for speciation. Even when adequate biopsy specimens are obtained, the fungus is often non-viable within the necrotic material, and diagnosis rests on histologic demonstration of fungal elements, making accurate speciation impossible without specialized inmunochemical stains. The first descriptions of a particular *Absidia corymbifera* strain as a human pathogen were made in the 19th century by Fübringer [3] and Podack. Since then, there have been no more than 15 cases well documented in the literature reviewed (Table 1). There are four cases reported in patients with hematologic malignancies [4–7], four in HIV patients [8–11], another one in a drug abuser [12], one following a kidney transplant [13], one in a patient with metastatic carcinoma [14], and two that did not present any

Table 1 Clinical features of reported cases of infections caused by *Absidia corymbifera*

Ref./year	Age/Sex	Underlying disease	Clinical form	Therapy	Outcome
13/1972	NA	Kidney transplant	Rhinocerebral	NA	Cured
6/1979	55/M	Acute leukemia	Cutaneous	Surgery + Amphotericin B	Died
12/1982	27/M	Drug abuser	Rhinocerebral	Not antifungal	Died
14/1982	50/F	Metastatic carcinoma	Disseminated	Not antifungal	Died
4/1987	54/F	Acute leukemia	Rhinocerebral	Amphotericin B	Died
4/1987	41/F	Lymphoma	Rhinocerebral	Amphotericin B	Died
5/1988	49/F	Acute leukemia	Disseminated	Amphotericin B	Died
15/1988	56/M	Healthy	Rhinocerebral	Amphotericin B	Died
16/1988	45/M	Healthy	Pulmonary	Surgery + Amphotericin B	Cured
9/1989	29/M	AIDS	Renal	Amphotericin B	Cured
10/1990	35/M	AIDS	Pulmonary	Amphotericin B	Died
11/1992	35/M	AIDS	Cutaneous	NA	Cured
8/1993	24/M	AIDS	Renal	Amphotericin B	Cured
7/1995	NA	Acute leukemia	Cutaneous	NA	Cured
PR/1996	60/M	Inflammatory bowel disease	Disseminated	Amphotericin B	Died

NA=not available; PR=present report.

predisposing factors [15,16]. The most common forms of presentation have been rhinocerebral, pulmonary, cutaneous and disseminated forms. Characteristically, there is a high mortality rate; in fact, we only found three reports of survival.

Systemic amphotericin B is the drug of choice. It is recommended to start with maximal doses from the beginning, so this mucormycosis would be an excellent indication for lipid-based preparations. In our case we started with a dose of 0.7 mg/kg/day because renal function was deteriorating. But this was obviously inadequate, as the patient state deteriorated, and he finally died before we could increase the total dosage of antifungal. Species of *Absidia* have been shown to be susceptible in vitro to most antifungal agents, and there is a report of three patients with mucormycosis infection who have been effectively treated with fluconazole [17].

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Subinhibitory concentrations of gentamicin reduce production of listeriolysin, the main virulence factor of *Listeria monocytogenes*

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The facultatively intracellular Gram-positive rod *Listeria monocytogenes* is the causative agent of severe infections in humans and animals, e.g. sepsis and meningoencephalitis. The treatment of choice is ampicillin in combination with gentamicin [1]. Because of poor penetration through the blood–brain barrier and into the cytoplasm of cells where the listeriae multiply, these antibiotics are likely to reach concentrations below the levels obtained in the blood at the site of infection.

Certain antibiotics are able to retard growth of bacteria at concentrations below the minimal inhibitory concentration assessed visually. In addition, some antibiotics are capable of selectively inhibiting the production of virulence factors by pathogenic bacteria [2]. Ampicillin has recently been shown to reduce the production of listeriolysin [3]. Listeriolysin is an essential virulence factor of *L. monocytogenes* because it enables the bacterium to reach the cytoplasm of infected cells, and to start multiplication [4].

Inhibition of the production of listeriolysin could also contribute to the therapeutic action of gentamicin on human listeriosis. Therefore, the effect of genta-